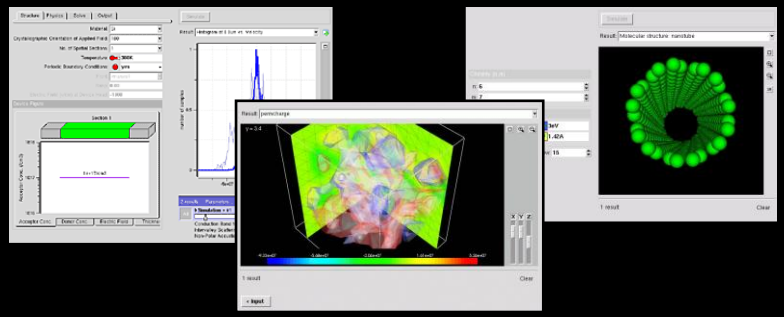
nanoHUB.org: Cyberinfrastructure for Nanotechnology Research and Education

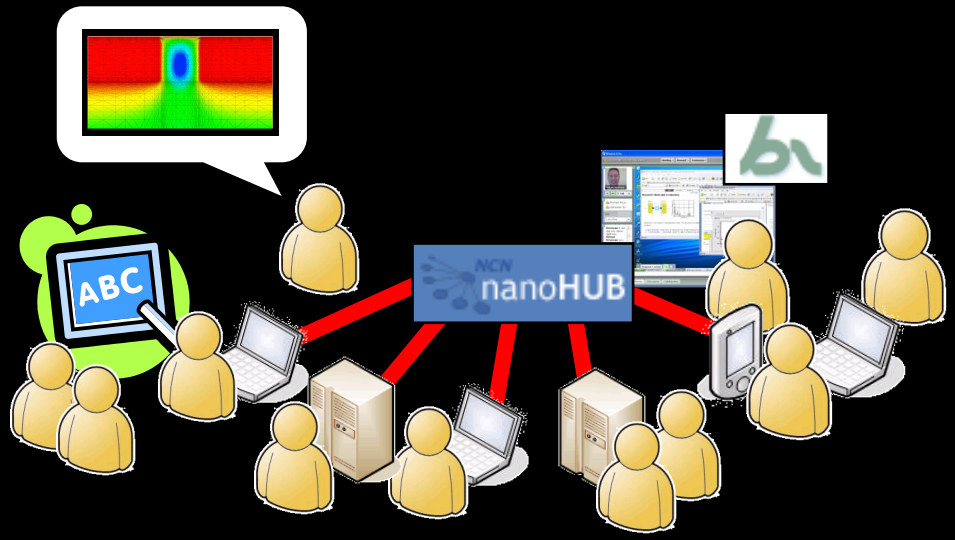
Michael McLennan
Network for Computational Nanotechnology
Purdue University

What is nanoHUB?

Online simulation…



…and more!



Demo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[Demo >>]

Who's using nanoHUB?

5.5 million hits last month

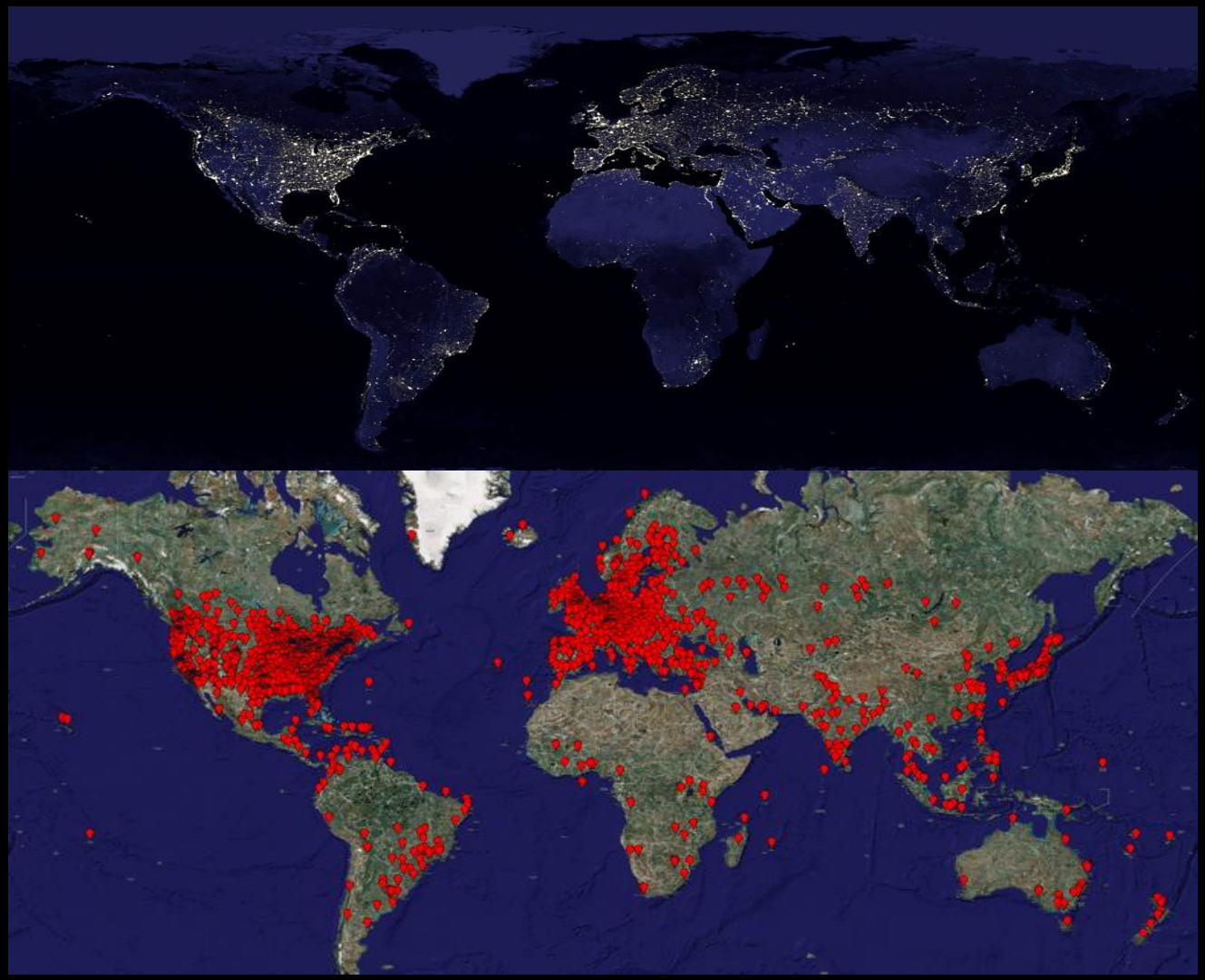
85,184 users last 12 months

374,527 simulation jobs last 12 months

51 of the Top 50 Engineering Schools

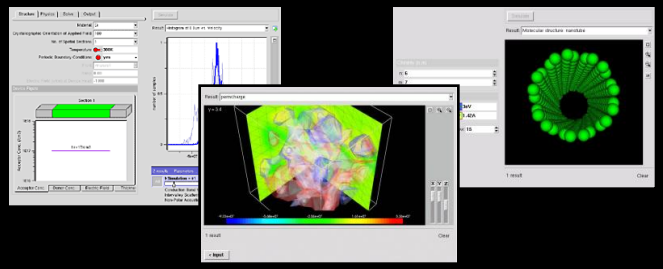
14% of all .edu domains

Who's using nanoHUB?

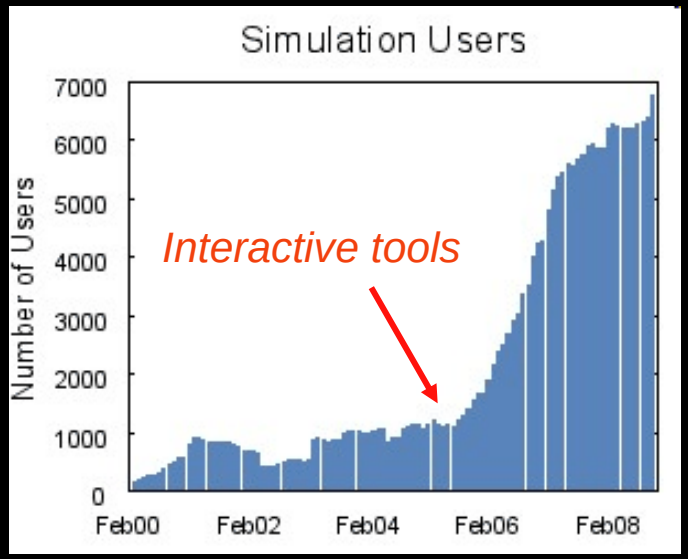


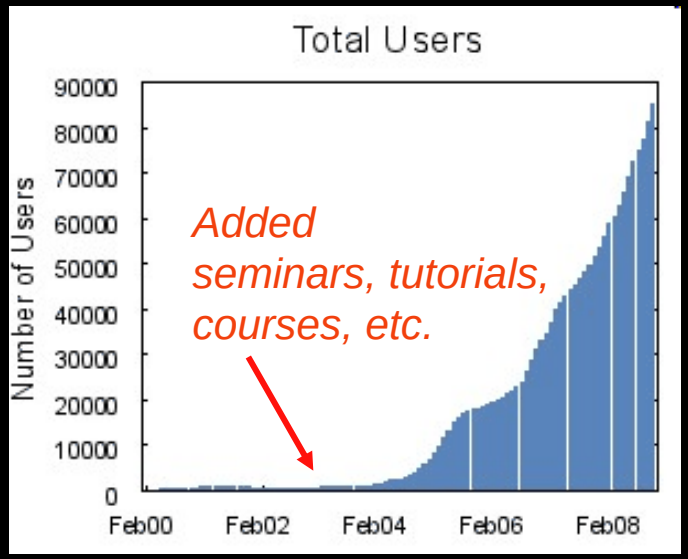
Strong growth

Online simulation…



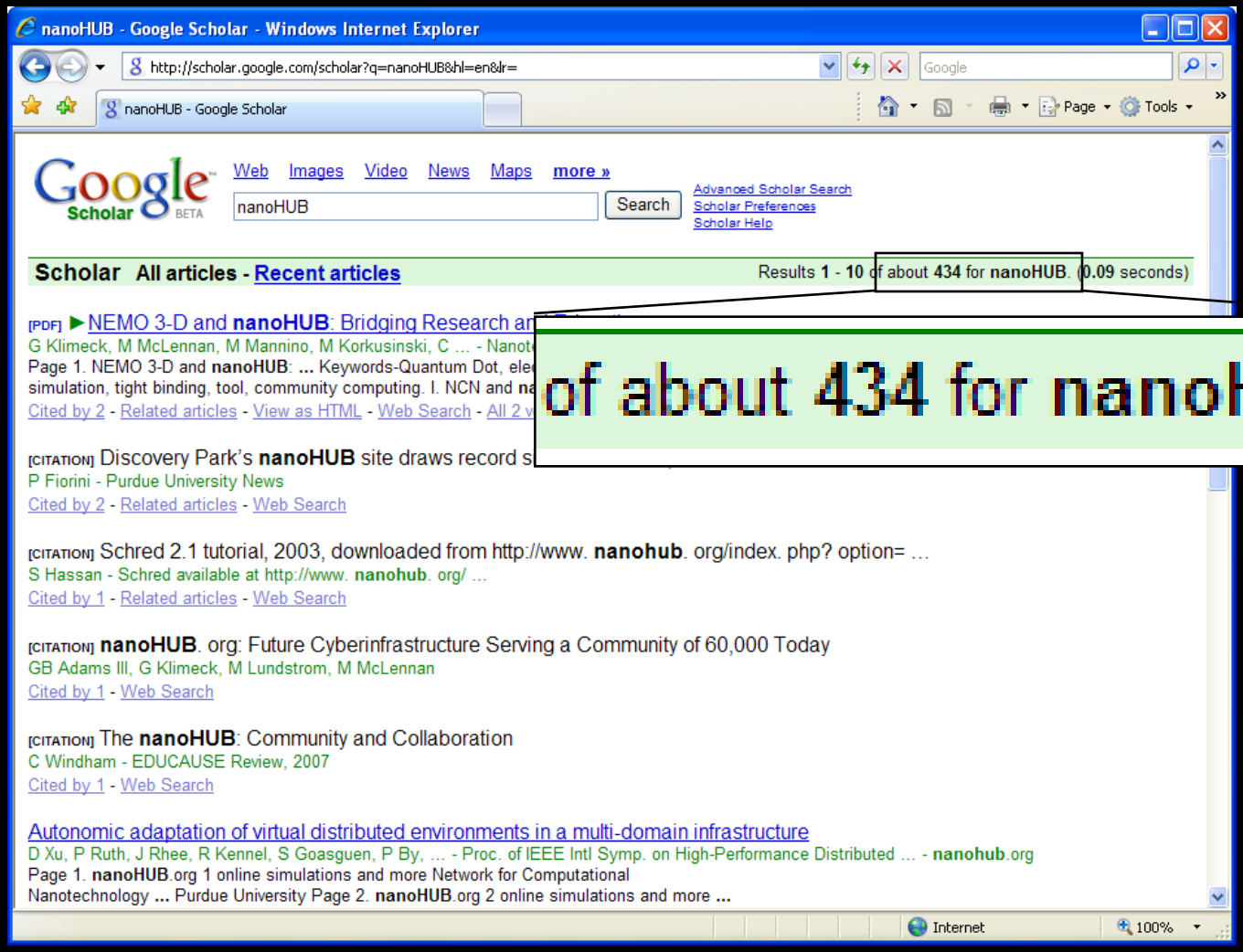
…and more!



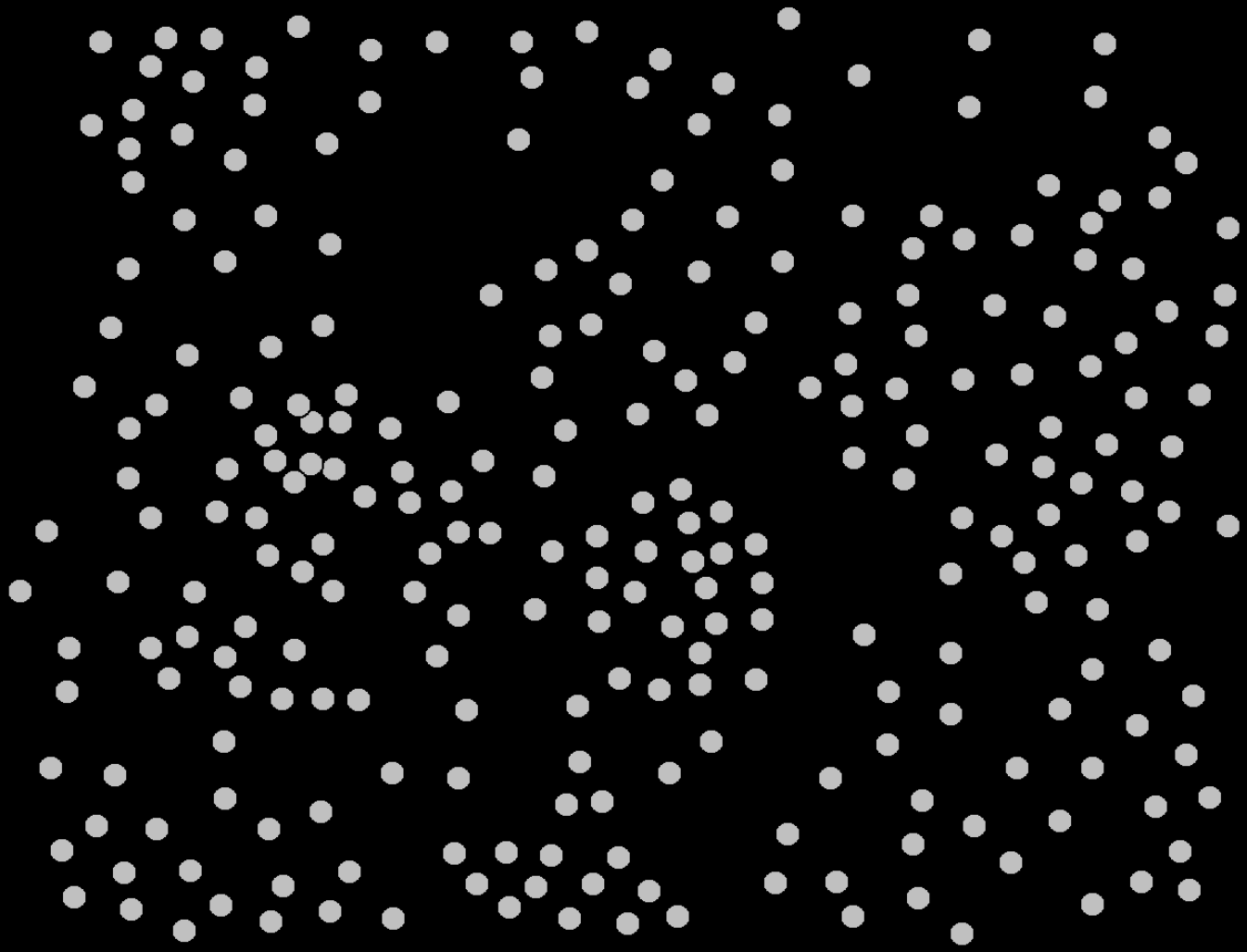


Google Scholar

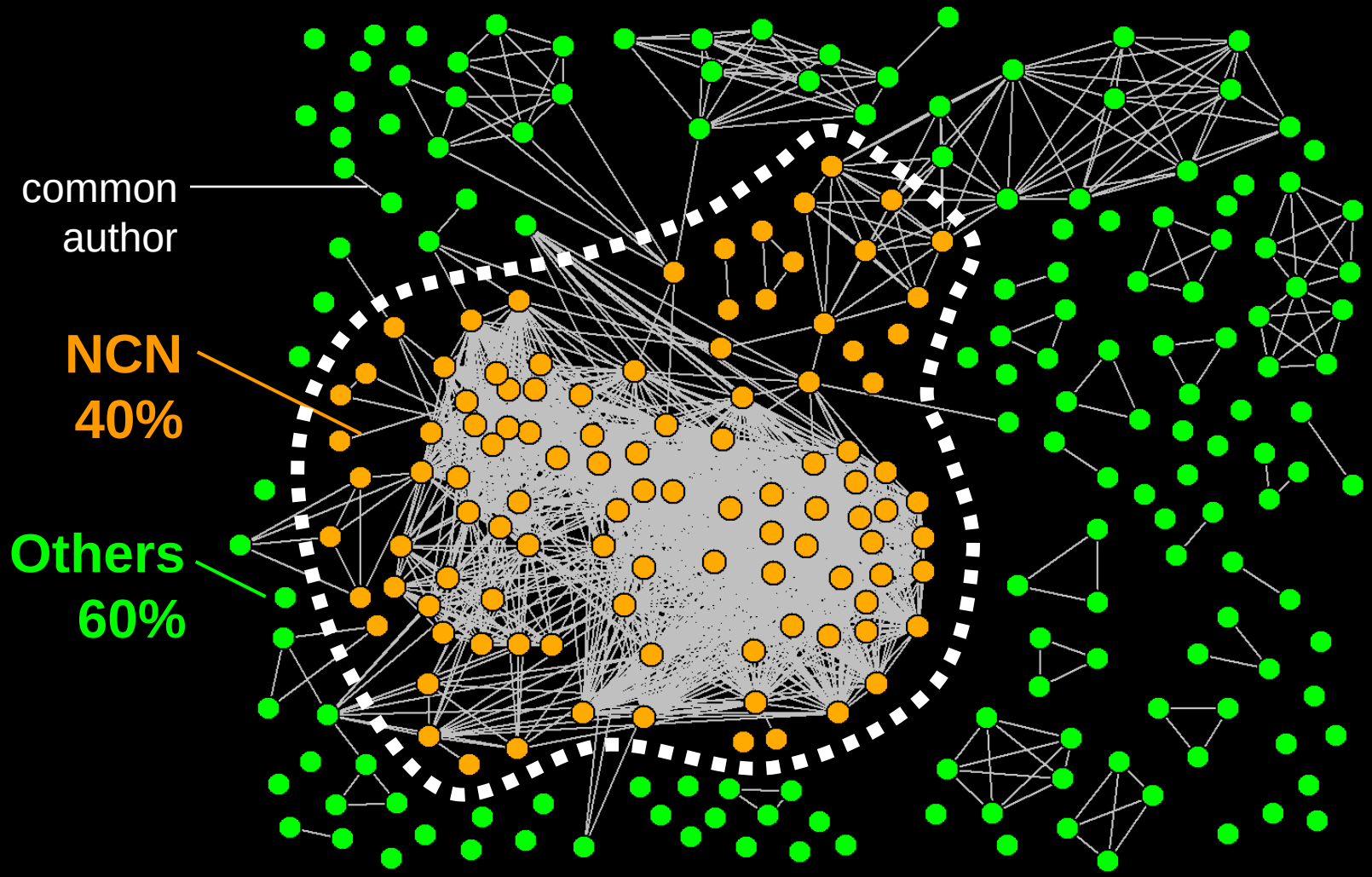
finds 434 citations to nanoHUB



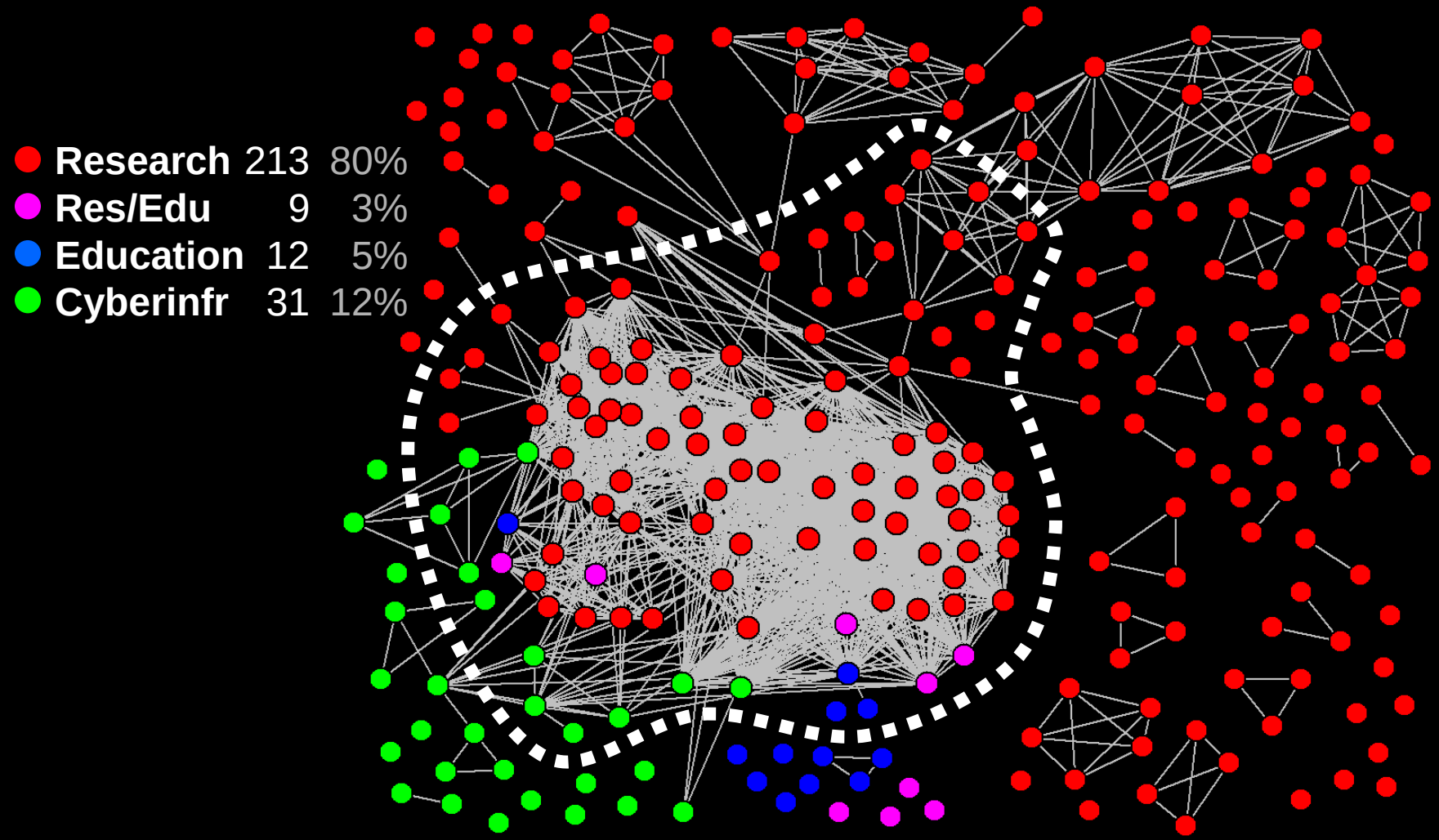
265 Citations



265 Citations… Who?

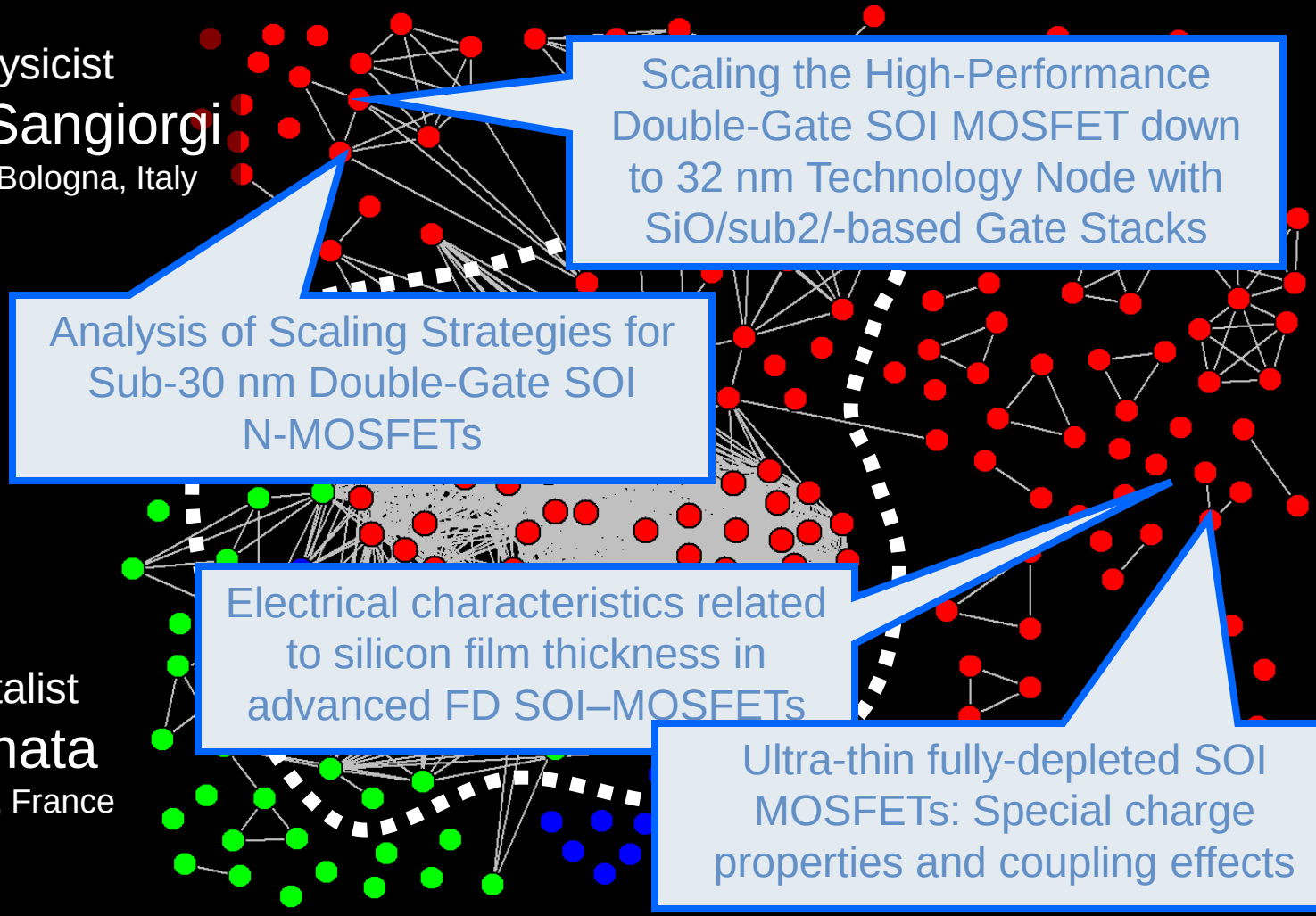


265 Citations… Cited for what?



265 Citations… Examples

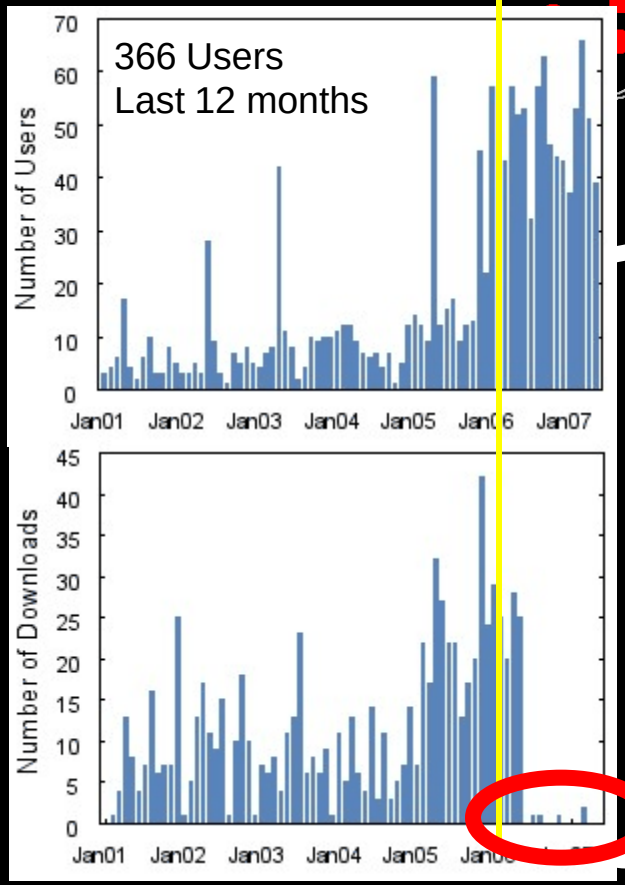
Device Physicist
Enrico Sangiorgi
University of Bologna, Italy



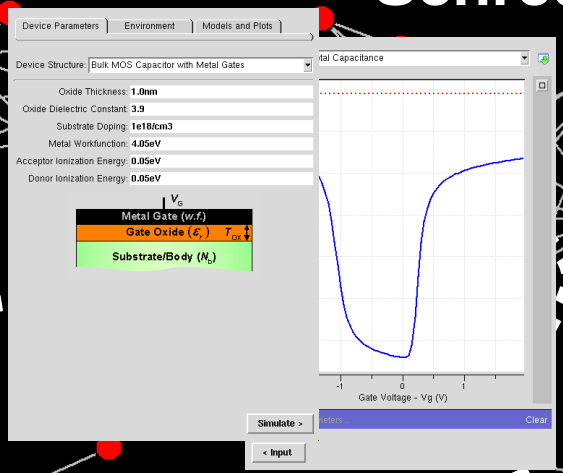
Experimentalist
Akiko Ohata
IMEP Minatec, France

Downloading is Dead

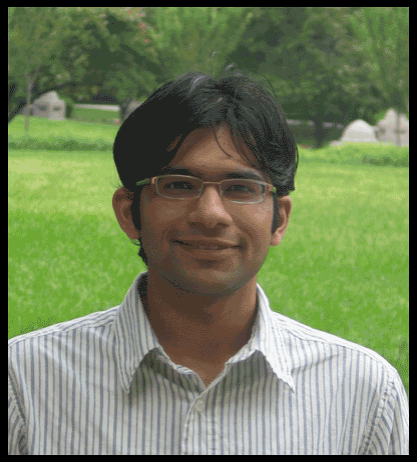
Rappture version Feb 06



Schred: 80 Citations



- Same behavior across all similar converted tools
- User's don't have to download/install software



Saumitra Mehrotra

Univ. of Cincinnati

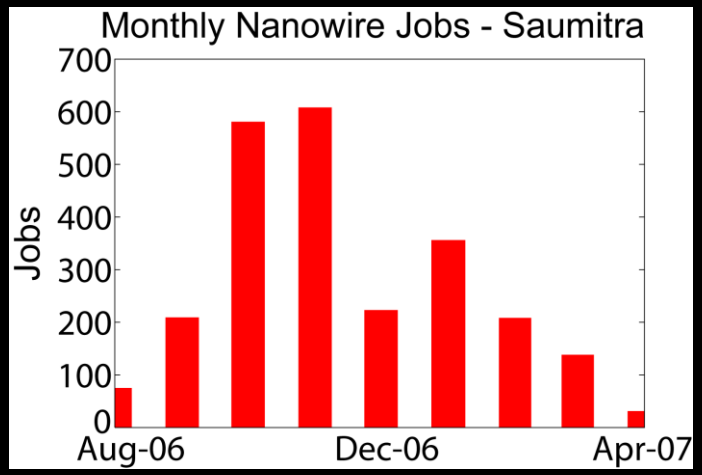
August 2006 - April 2007:

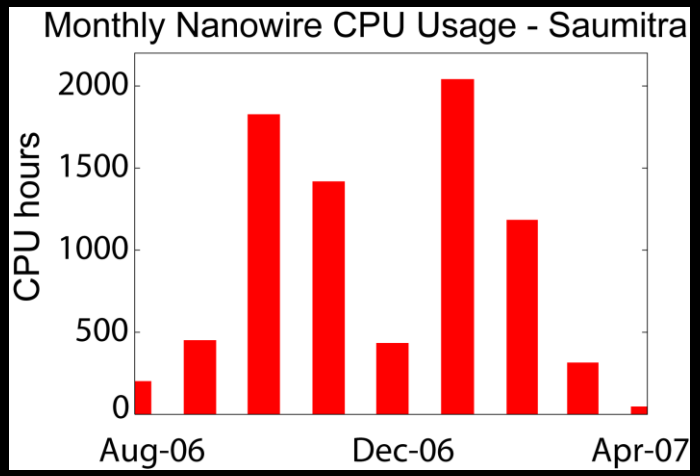
26 tools / 3,327 simulations

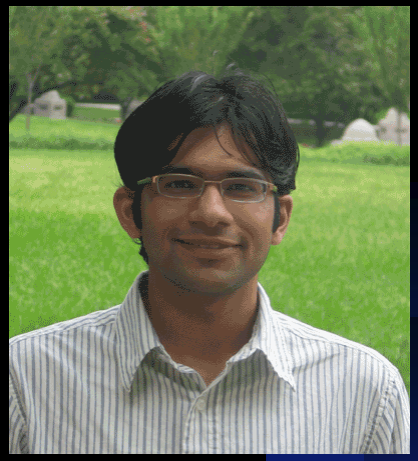
- 47 simulations: bandstructure lab
- 240 simulations: FETtoy
- 2,855 simulations: nanowire
- 8,242 nanowire CPU hours

- "and more" content
  134 items, 52 hours

- 96 support tickets
  69 entered manually,
  27 filed automatically by application







IEEE Workshop on Microelectronics and Electron Devices (WMED), April 20 2007

Process Variation Study for Silicon

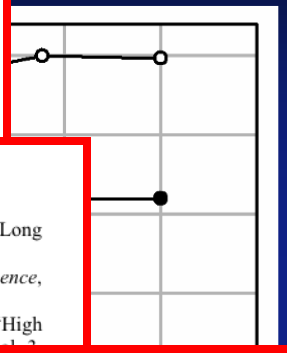
Simulation Tool

SiNW FET Vs FinFET – Gate Length Variation

Process Variation Study for Silicon Nanowire Transistors

performance in circuits and superior reproducibility for the SiNW FETs.

Fig. 4 shows the variation in the threshold voltage with change in the gate dielectric thickness. Again, the SiNW FET shows a smaller variation (1.2 mV/A) compared with the FinFET's 5 mV/A. Also of interest is the sensitivity of the devices to the gate length. Shown in Fig. 5 is the threshold



REFERENCES

[1] W.S.Shi et al., "Synthesis of Large Areas of Highly Oriented, Very Long Silicon Nanowires," *Adv. Mater.* 12, 1343, 2000.

[2] D. Ma et al.," Small-Diameter Silicon Nanowire Surfaces," *Science*, 299, p. 1874, 2003.

[3] Y. Cui, Z. Zhong, D. Wang, W. U. Wang, and C. M. Lieber, "High

[7] J. Wang, E. Polizzi, M. Lundstrom, "A three-dimensional quantum simulation of silicon nanowire transistors with the effective-mass approximation," *Journal of Applied Physics* **96**(4), pp. 2192-2203, 2004.

[8] Simulations were performed on http://nanohub.org

[9] J. Wang, E. Polizzi, and M. Lundstrom, "A computational study of ballistic silicon nanowire transistors," in *IEDM Tech. Dig.*, Dec. 8–10, 2003,pp. 695–698.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Tool Developer

Fortran F77

THE C PROGRAMMING LANGUAGE

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- Uploaded
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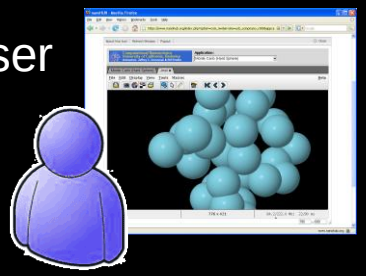
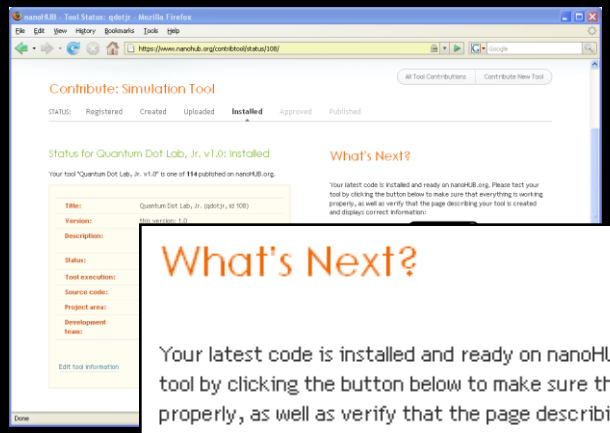
- Approved
- Published

End User



Web-based Publishing System



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Your latest code is installed and ready on nanoHUB.org. Please test your tool by clicking the button below to make sure that everything is working properly, as well as verify that the page describing your tool is created and displays correct information:

Test your application: Launch tool

Review the page describing your tool

We're waiting for You

Once you tested your tool and verified that it is working properly, click here to let us know:

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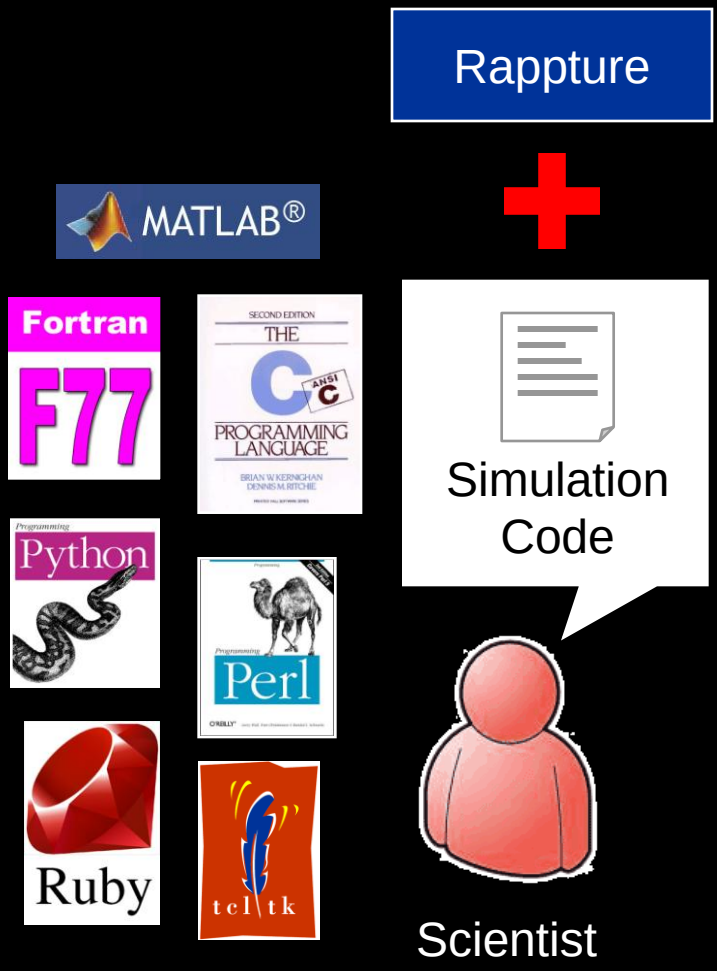
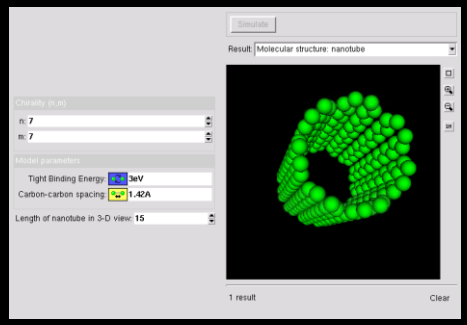
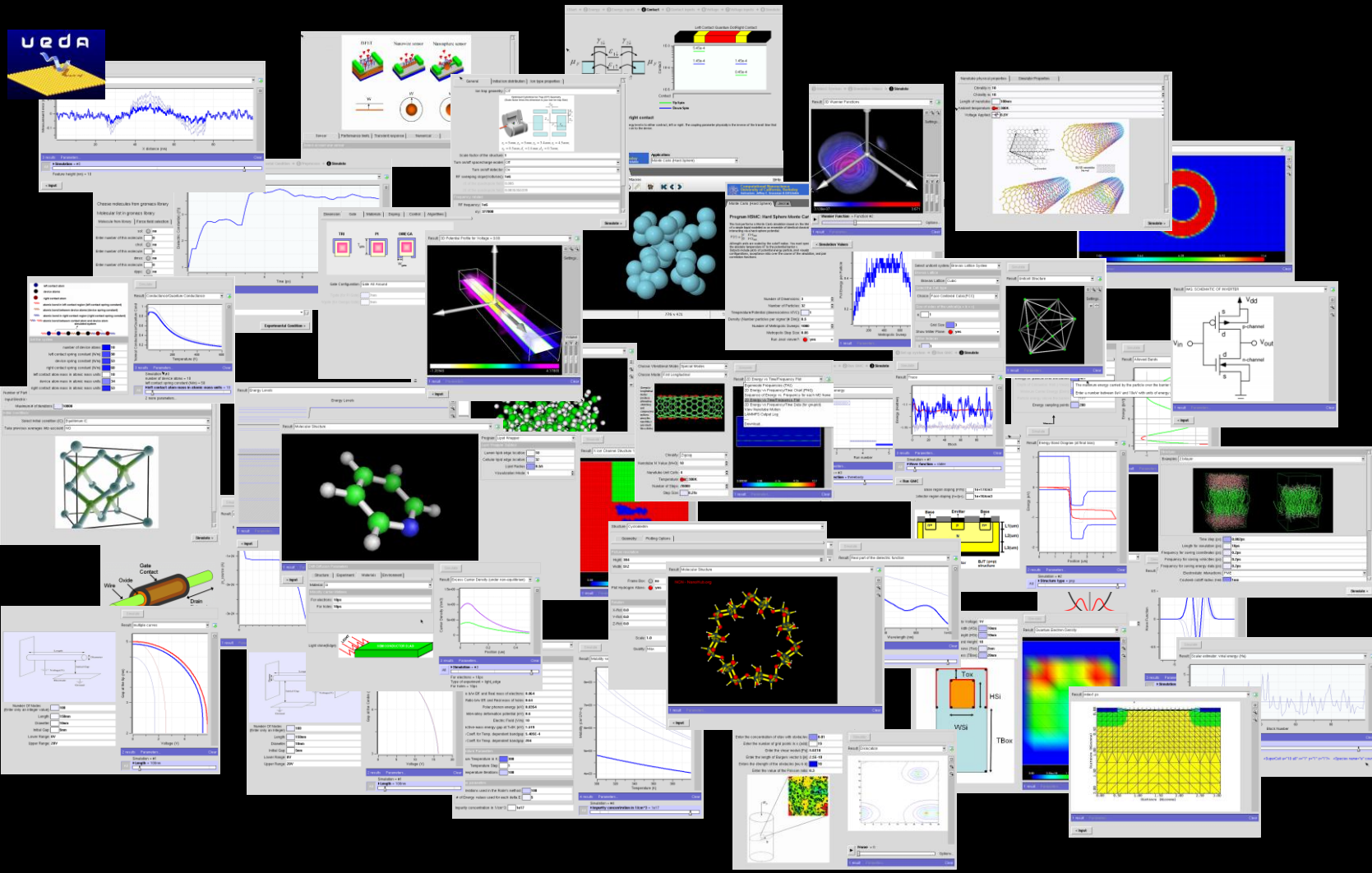
Rappture Toolkit



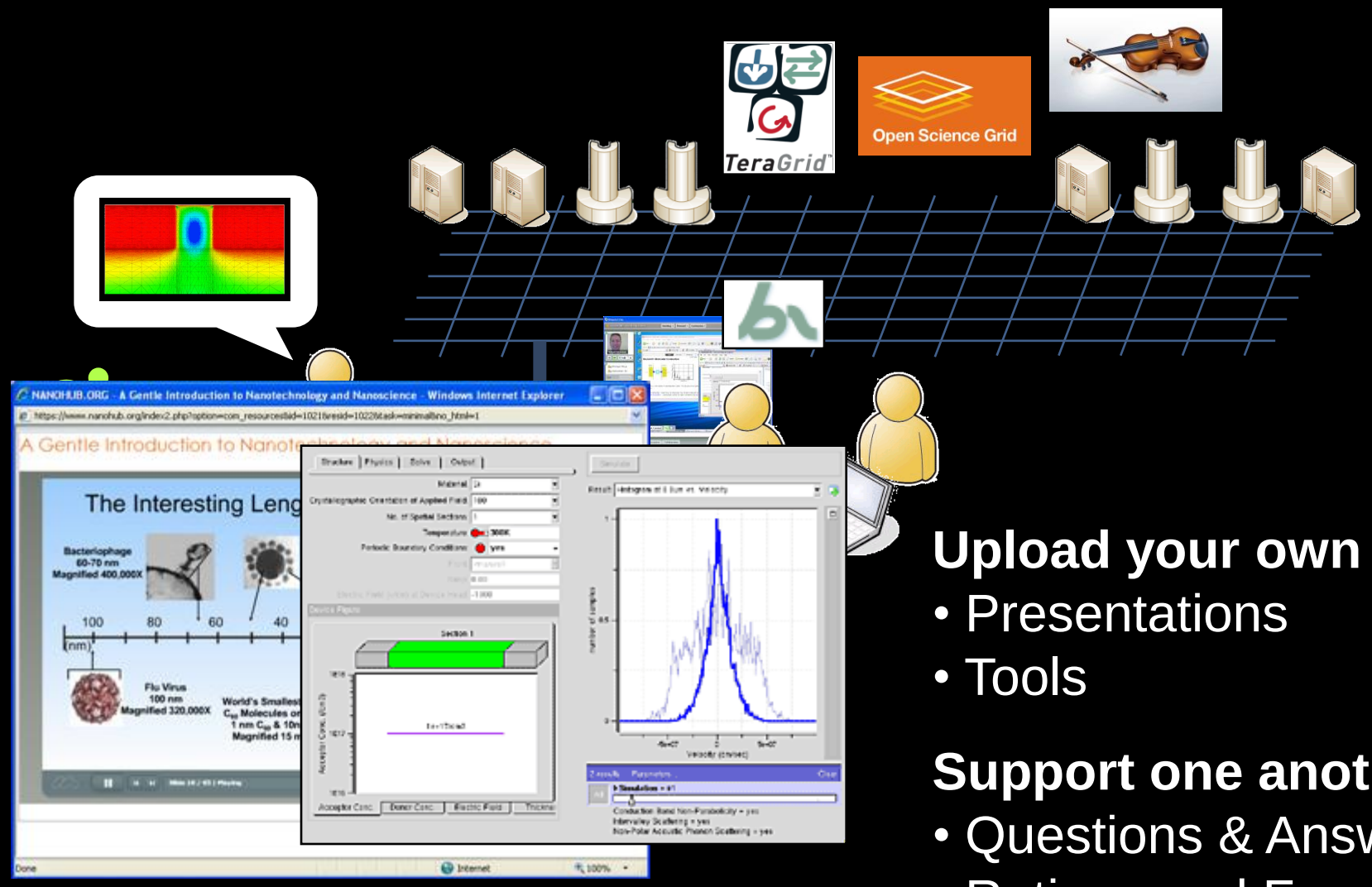


- Created by NCN in Nov 2004
- Create standard desktop apps
- Works with your favorite programming language
- Open Source
- Online at http://rappture.org

and 90 more coming soon



A New Way of Publishing



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